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SA-9/APOLLO
FIRING TEST REPORT

APOLLO-SATURN I/IB TEST & SYSTEMS ENGINEERING OFFICE
John F. Kennedy Space Center, NASA


E. R. Mathews, Chief



ABSTRACT

29336

Apollo/Saturn Space Vehicle SA-9, fourth of six Saturn I, Block II vehicles, was launched at 0937 EST on February 16, 1965, from Pad 37B at Cape Kennedy. All test objectives were successfully accomplished. The S-IV stage, IU, and the Apollo spacecraft were injected into a near-earth orbit. The Pegasus A payload, installed in the Service Module, deployed its wings and functioned as a micrometeoroid measurement system as planned.

Propellant transfer systems, ground support equipment, electrical support equipment, and the ground computer operated satisfactorily as did launch vehicle instrumentation and electrical systems.

A torus ring water supply pipe separated at several joints after vehicle liftoff. Known water damage to equipment is not considered to be serious at this time.

SA-9 caused less damage to LC-37 facilities and equipment than any previous launch.

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SECTION I

INTRODUCTION

A. SCOPE

This report presents information concerning the firing test objectives and test results pertinent to the launch of Saturn vehicle SA-9 from Launch Complex 37B. Post-launch information has been included in sufficient detail to comply with the requirements of the Saturn Flight Evaluation Working Group.

B. DESCRIPTION

1. SA-9 Vehicle. SA-9 was the fourth Saturn I vehicle to be launched in a planned series of six Block II vehicle launches. SA-9 vehicle overall length was 188 feet with a diameter of 21 feet 5 inches, excluding fins. The vehicle consisted of an S-I stage, S-IV stage, instrument unit, and a boilerplate Apollo Spacecraft containing a Pegasus A micrometeoroid experiment.

2. S-I First Stage. The S-I stage measured 80 feet 3 inches long with a tank section diameter of 21 feet 5 inches, a maximum diameter (including fins) of 40 feet 8 inches, and a dry weight of approximately 103,000 pounds. The stage was powered by eight Rocketdyne model H-1, fixed thrust liquid propellant engines developing a total nominal sea-level thrust of 1.5 million pounds.

The four inner engines were fixed in a 3-degree outward cant. For attitude control, the four outer engines were capable of being gimballed in an 8-degree square pattern.

Four Aerojet model MB-1 solid-propellant rocket motors provided first stage retro-thrust at S-I/S-IV separation. These motors are designed to develop 37,000 pounds of thrust each for 2.15 seconds.

3. S-IV Second Stage. The S-IV stage measured 41 feet 5 inches long, with a maximum diameter of 18 feet 4 inches and a dry weight of approximately 13,000 pounds. Stage propulsion was provided by six Pratt and Whitney model RL-10A3 engines, providing 15,000 pounds of thrust each. The engines were canted 6 degrees and were capable of being gimballed in a 4-degree square pattern for attitude control.

Propellant-ullage positioning was provided by four Thiokol model TX-280 solid-propellant rocket motors, designed to develop 4,800 pounds of thrust each for 3.9 seconds. These ullage rockets were jettisoned after S-IV engine ignition.

4. Instrument Unit (IU). The IU, located between the S-IV stage adapter and the spacecraft, measured 2 feet 10 inches long, with a diameter of 12 feet 10 inches, and weighed approximately 2,650 pounds. It contained guidance and control equipment, four telemetry links, and the airborne portions of five tracking systems. Other systems contained in the IU include a power

supply and distribution system, and the nitrogen supply for the gyro air bearings. Sensors mounted throughout the IU were used to detect inflight environmental conditions.

5. Apollo Spacecraft. The Apollo spacecraft (BP-16) included a boilerplate command module (CM), boilerplate service module (SM), spacecraft adapter and launch escape system (LES) with live jettison motor. The spacecraft weighed 18,600 pounds and measured 63 feet 4 inches in length (adapter field splice to LES nose cone), with a maximum diameter of 12 feet 10 inches.

6. Pegasus A (Micrometeoroid Experiment). The Pegasus A payload was located in the service module in an undeployed status and was permanently mounted on the S-IV stage. The Pegasus A is obtaining information concerning the magnitude and direction of intermediate size meteoroids in the near-earth space environment. Prior to deployment, Pegasus measured 208 inches by 84 inches by 95 inches. When fully deployed, the wing panels extend a total of 96 feet.

7. Camera. One television camera, located in the spacecraft service module adapter section, was used to transmit real-time coverage of Pegasus A status from liftoff through deployment.

8. Telemetry. The Saturn space vehicle transmitted a total of over 1,284 measurements on 15 telemetry links. Thirteen of these links were carried on the launch vehicle, the remaining two on the spacecraft.

C. TEST OBJECTIVES

1. The primary objectives were:
 - a. Earth orbit of Pegasus A (micrometeoroid experiment).
 - b. Flight test of a closed-loop guidance system.
 - c. Earth orbit of the spent S-IV stage, IU and payload as a unit.
2. Secondary mission objectives were:
 - a. Demonstration of the physical and flight compatibility of the launch vehicle stages and spacecraft.
 - b. Demonstration of launch vehicle and various research and developmental instrumentation.

SECTION II

PRELAUNCH MILESTONES

The following is a chronological summary of events and preparations leading to the launch of SA-9:

October 23, 1964	S-IV arrived via aircraft and off-loaded to Hangar AF.
October 30, 1964	S-I and IU-9 arrived via barge at Hangar AF dock area and off-loaded.
November 3, 1964	S-I erected and secured.
November 10, 1964	S-I umbilical connected.
November 12, 1964	S-I power applied.
November 13, 1964	Apollo Spacecraft Service Module and adapter arrived via aircraft and off-loaded to Hangar AF.
November 19, 1964	S-IV and IU erected.
November 20, 1964	S-IV umbilical connected.
November 23, 1964	Power applied to IU.
November 24, 1964	S-I RF checks completed.
November 25, 1964	Power applied to S-IV stage.
December 8, 1964	IU RF checks completed.
December 14, 1964	Electrical mate of S-IV, IU, and S-I completed and power applied.
December 16, 1964	S-I/IU Power-Transfer Test completed.
December 17, 1964	Launch vehicle EBW functional test completed.
December 21, 1964	Launch Sequence Malfunction Test completed.
December 29, 1964	Pegasus A (payload) arrived via aircraft.
December 30, 1964	Pegasus A hangar checkout started.

January 5, 1965	ST-124 installed.
January 12, 1965	Pegasus hangar checks completed.
January 13, 1965	Pegasus A erected on launch vehicle.
January 14, 1965	Command module erected on launch vehicle.
January 15, 1965	Pegasus electrical mate with launch vehicle completed.
January 21, 1965	Space vehicle EBW functional test completed.
January 22, 1965	Space vehicle RF checks completed.
January 25, 1965	Plug Drop and Swing Arm Overall Test completed.
February 1, 1965	S-I, S-IV Ordnance Installations completed.
February 5, 1965	All Systems Overall Test completed.
February 12, 1965	Countdown Demonstration Test completed.
February 15, 1965	Terminal countdown started.

SECTION III

COUNTDOWN AND HOLD SUMMARY

Terminal countdown activities began February 15, 1965, at 2155 EST following the L-1 day activities. Vehicle operations began at 2325 EST at T-515 minutes. Operations were all normal according to the planned procedures until T-80 minutes (0640 EST) when the count was halted. At that time, a questionable indication concerning the Pegasus B-battery charging circuit was noted. It was decided to discharge the battery and recharge it to verify proper operation of the battery control circuit. This procedure required approximately 30 minutes, including verification. It was decided to utilize the 30-minute preplanned built-in hold at this time rather than at T-30 minutes. The count was resumed at 0710 EST and all operations were again normal until 0755 EST when the ETR real-time flight-safety computer experienced a power failure. A hold was called at T-26 minutes (0804 EST), and the computer program was reinserted. The reinsertion and checkout required one hour and seven minutes. The countdown was resumed at 0911 EST and proceeded normally through lift-off which occurred at 0937 EST, February 16, 1965.

SECTION IV

GSE AND LAUNCH COMPLEX PERFORMANCE

A. PROPELLANT LOADING

1. Sequence of Major Events. RP-1 fuel was loaded into the S-I stage on February 10, 1965. LOX and LH₂ were loaded during the launch countdown. RP-1 was adjust-level drained in the launch countdown on February 16, 1965. The sequence of operations during the launch countdown was as follows:

- a. Precool filled S-I stage with partial load (20%) LOX for leak check.
- b. Loaded S-IV stage with LOX to 98%.
- c. Precool filled S-I stage LOX to 20% then fast filled to 95%.
- d. Replenished both S-I and S-IV stages with LOX.
- e. Slow filled S-IV stage LH₂ to 15%.
- f. Fast filled S-IV stage LH₂ to 95%.
- g. Slow filled S-IV stage LH₂ to 99.25%.
- h. Replenished S-IV stage LH₂.
- i. Adjust-level drained RP-1 from S-I stage.

2. RP-1 Operations. RP-1 was loaded on February 10, 1965. The S-I stage was slow filled by individual component operation at a rate of 200 gpm to a 15% level, as indicated by the loading computer, for leak checks of both the S-I stage and ground system. Upon completion of the leak checks, RP-1 was loaded by the automatic fast-fill sequence at a rate of 2000 gpm to 98% full, as indicated by the fuel loading computer. Slow fill was automatically initiated and a pressure correction of +.325 psi was dialed into the computer. The system continued filling the stage at a rate of 200 gpm until the 100% indication was received. Adjust-level drain was initiated with a correction factor of +.125 psi. Because of undetermined flight-loading requirements, the stage was then replenished to a +.325 psi correction in the loading computer. Both density and loading systems were within tolerances, and no problems were encountered during loading operations. Subsequent loading tables selection necessitated recalibration of the loading computers and draining of the RP-1 transfer line section between the S-I stage fill-and-drain valve and the adjust-level valve.

At T-135' in the Countdown Demonstration Test (CDDT), RP-1 was replenished to a +.320 psi correction in anticipation of performing an adjust-level drain later in the count. At T-10' an adjust-level sequence was initiated with a correction factor of +.150 psi dialed into the loading computer. All systems were within tolerance with a stage bulk-fuel temperature average of 75°F (LOX not loaded).

At T-10 minutes in the launch countdown, the S-I stage RP-1 level was adjusted to a set pressure correction of +.015 psi, based on a nominal fuel density of 100.06% as indicated by the density computer. The loading computer completed the adjustment with a 100.07% indication. The deviation between the temperature calculated from the percent nominal density (as indicated by the density computer) and the average of fuel tank temperatures (as recorded) varied

from 0.22°F to 1.29°F with an average difference of 0.56°F. The line-insert sequence was initiated at T-5'50", and the mast purge was initiated at T-4'30". The lift-off signal closed the booster line valve, but mast purge was lost approximately 3 seconds after lift-off due to the solenoid valve being shorted by water from the torus ring. No problems resulted from loss of the mast purge. All systems operated satisfactorily.

3. LOX Operations. LOX loading during the launch countdown was performed as follows: S-I precool was initiated at T-374'40", and the 18% leak-check loading was completed at T-330'16". At the 15% level, S-I stage replenish was activated, and verified to 20%. Both the S-I stage and the LOX transfer system were leak checked. At T-221'30" S-IV LOX precool was initiated. The S-IV main-fill precool valve was open for approximately 9 minutes 30 seconds. An indication of adequate stage precooling was obtained. S-IV main fill was started and an indication of 98% full was recorded at T-198'33". S-I LOX precool was initiated at T-155'20" with the LOX level computer set at approximately 15%; however, precool was continued until the tank level reached 20%. A +.400 psi correction was dialed into the computer and S-I main fill was initiated. At 65% full signal, LOX replenish precool was initiated. At S-I 95% full signal, fast fill was terminated. Automatic replenish of both the S-I and S-IV stages was interrupted when the replenish tank-pressure-complete sensing switch opened at 157 psig, causing the system to revert to a storage-tanks-pressurized-complete status. The cause of the malfunction was determined to be the inability of the replenish tank pressurization system to keep up with the combined S-I and S-IV replenish requirements. The condition was further aggravated by an initially small replenish tank ullage volume (replenish tank topped to 28,000 gallons prior to start of sequence). The pressure switch was defeated and S-I/S-IV LOX replenish was re-initiated satisfactorily. At T-10 minutes, a final S-I LOX set pressure correction of -0.010 psi was dialed into the computer.

4. LH₂ Operations. LH₂ loading was initiated at T-80 minutes when transfer system precool was initiated. Slow fill of the S-IV stage was established at T-72 minutes and was continued until a 15% full indication was obtained at T-55 minutes. Main fill was initiated and the stage was loaded to 95% full at T-41 minutes. Automatic replenishing was initiated at T-40 minutes.

5. Malfunctions. Only one malfunction occurred in the propellant transfer systems. As mentioned in paragraph 3, the LOX replenish-tank-pressure-complete switch dropped out at 157 psig. This malfunction did not delay loading operations nor halt the countdown.

B. MECHANICAL GROUND SUPPORT EQUIPMENT

1. Damage to Active Ground Support Equipment.

a. The post-launch evaluation of the active ground support equipment systems revealed that the launcher, engine service platform, holddown arms, firing accessories, umbilical swing arms, environmental control system, and pneumatic distribution system sustained the launch of SA-9 with less damage than any previous launch. The utilization of shielding, insulation,

and reinforcement protected the systems to the extent that no major assembly was damaged beyond repair. During the operation of the launch water system after vehicle liftoff, the northeastern torus ring, figures 1 and 2, separated at several joints flooding the interior of the launcher, the launcher AGCS bridge, and AGCS levels to a lesser degree. Extent of damage to electrical cables in these areas is unknown at this time. Details of the preceding items are listed in the following paragraphs.

b. No significant damage was noted to the launcher, engine service platform, or main structures of the firing accessories. However, equipment and surfaces above and beneath the launcher were scorched and electrical cables, pneumatic flex lines, water quench hoses, cryogenic flex lines and bellows, and fuel flex hoses were burned beyond repair, figures 3 through 13. Damage to the LOX transfer line and LOX replenish installation atop the launcher was limited to burned flex hoses on the LOX mast and burned flex bellows on the LOX replenish coupler. The flexible elbow at the base of the LOX mast and the flex hose at the LOX replenish coupler, having been covered with blast resistant material, revealed no exterior blast or fire damage. The controlled flexing joints in the LOX replenish installation were sound and appeared to be reusable. The holddown arms received no appreciable damage.

c. A visual inspection of the umbilical swing arm system, figures 14 through 17, revealed damage to the system as follows: USA #1 air-conditioning duct and USA #4 housing retract lanyard were frayed; the pointer on USA #1 accumulator pressure gauge (75M50174-13) was removed from its shaft.

d. The environmental control system sustained the SA-9 launch with only minor damage to ducts at the 35-foot level.

e. Except for possible water damage to the solenoid valves inside the launcher, the pneumatic distribution system received no appreciable damage. The solenoid valves will be sent to the Mechanical Systems Laboratories for analysis and possible reconditioning.

f. All pneumatic tubing appears to be sound and in good order. No lines are scheduled to be replaced.

2. Performance of the Active Ground Support Equipment Systems. A review of the launch records available to date indicates that all active ground support equipment systems performed within design specifications. No deficiencies were noted.

C. ELECTRICAL SUPPORT EQUIPMENT

The electrical support equipment responded and performed normally during the SA-9 countdown and automatic sequence. The ESE did, however, receive extensive water damage shortly after liftoff. Several cables and distributors in the launcher and in the Pneumatic Control Distribution Room in the AGCS were damaged and required drying out or replacement. No impact on SA-8 checkout schedule is anticipated.

D. GROUND COMPUTER

Power was applied to the RCA 110A computer at 2145 EST, February 15, 1965. Computer preparation was complete at approximately 2245 EST, and the oper-

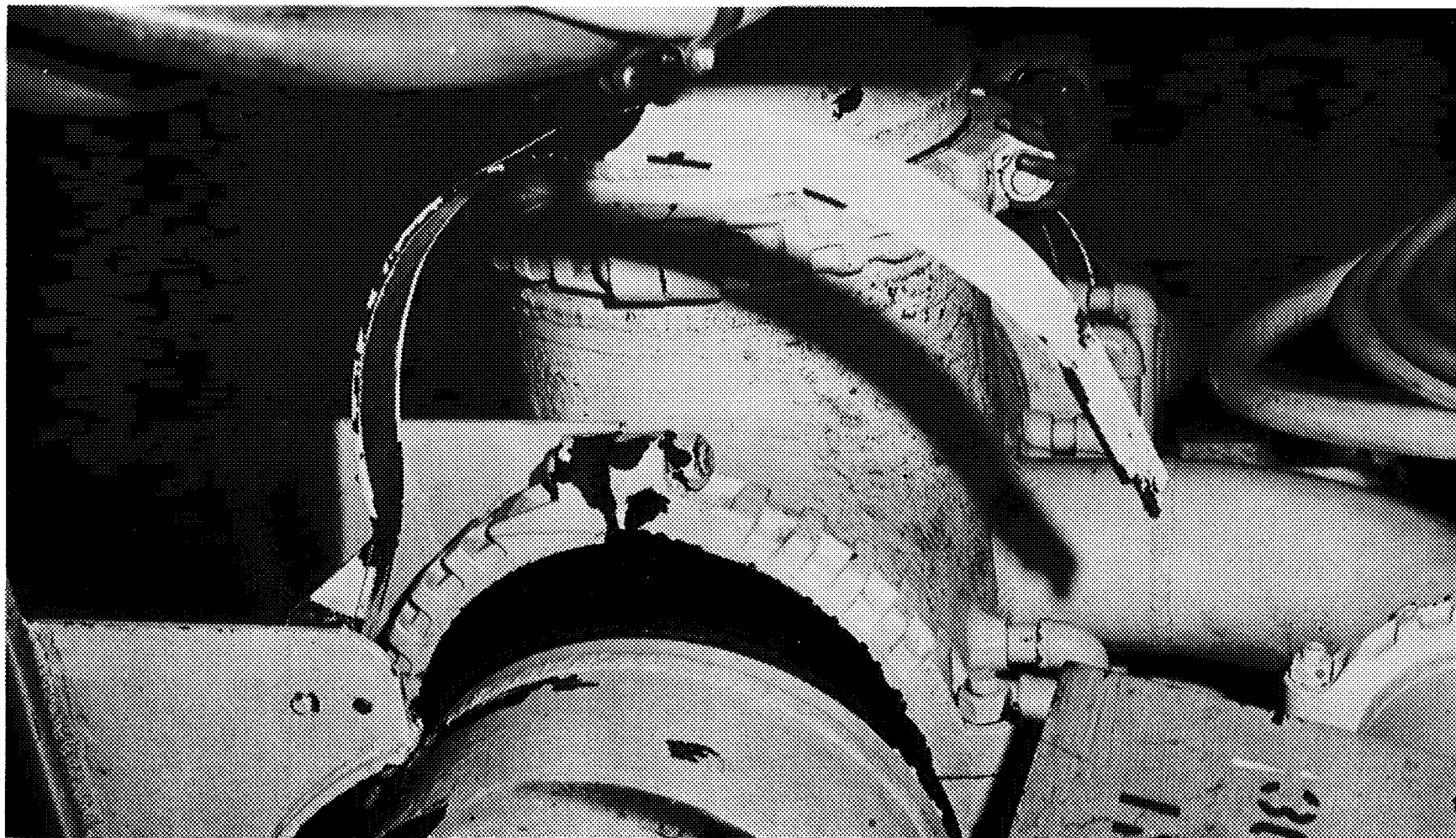


Figure 1. North Torus Ring, showing line rupture.

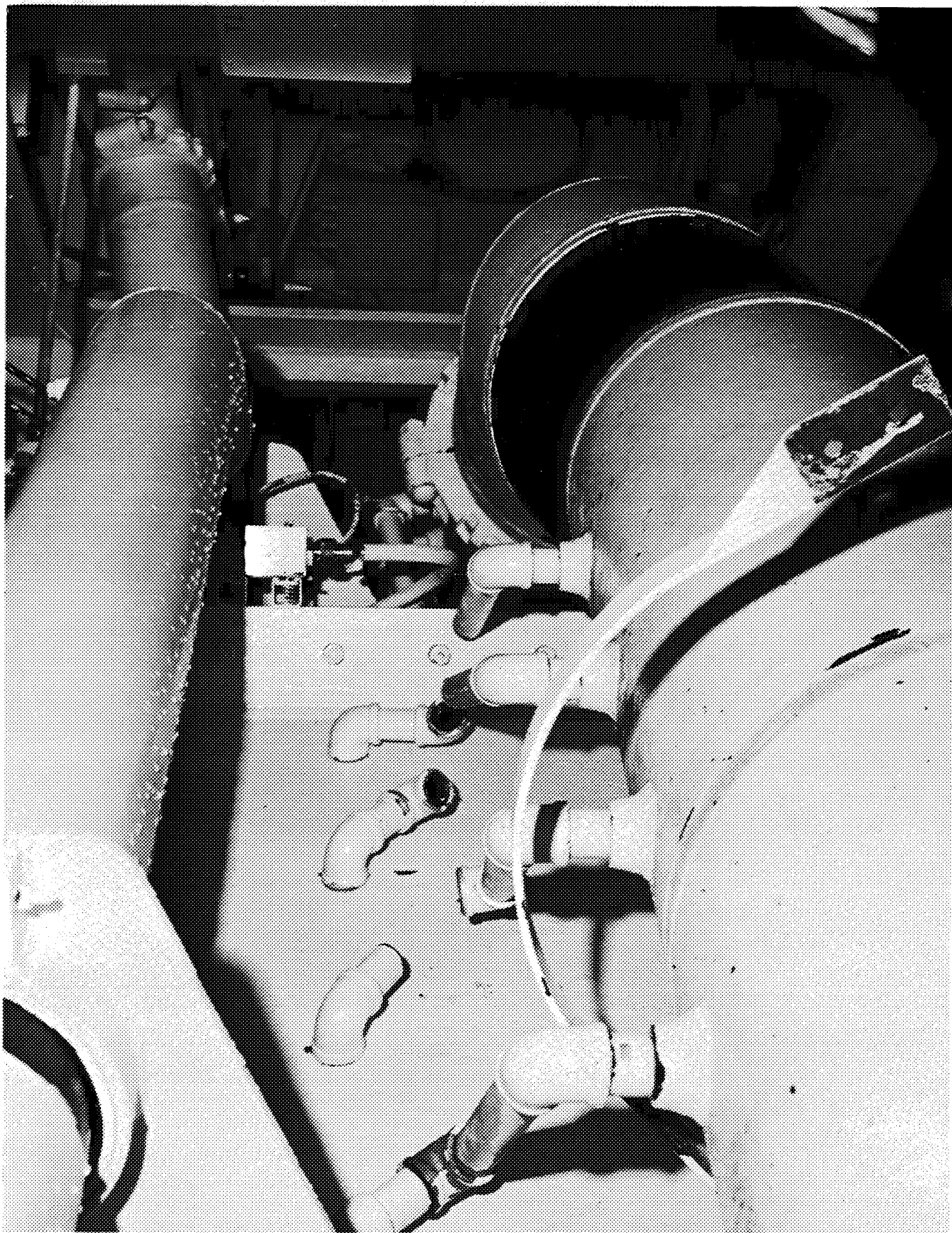


Figure 2. North Torus Ring, showing line rupture.

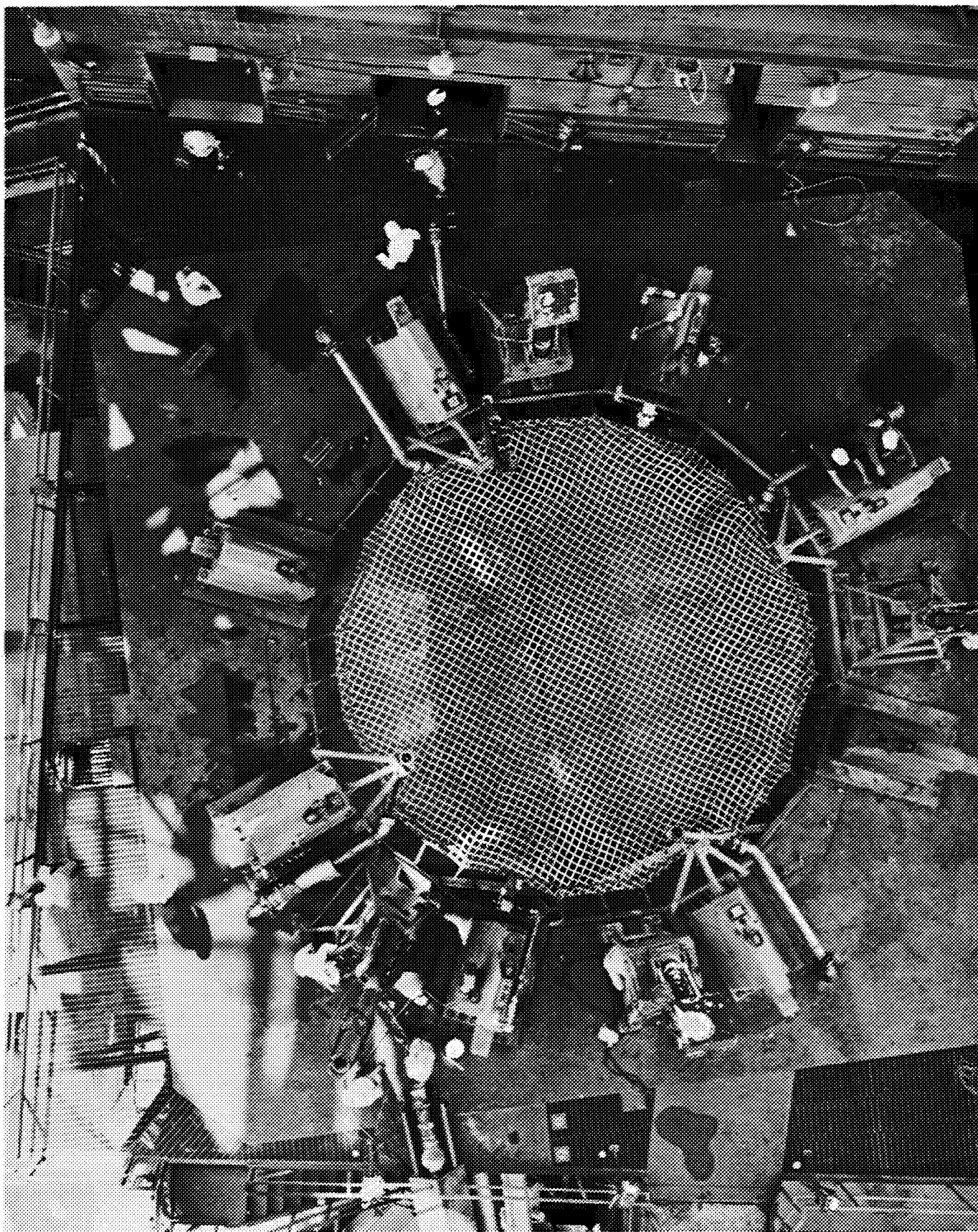


Figure 3. Launcher Deck.

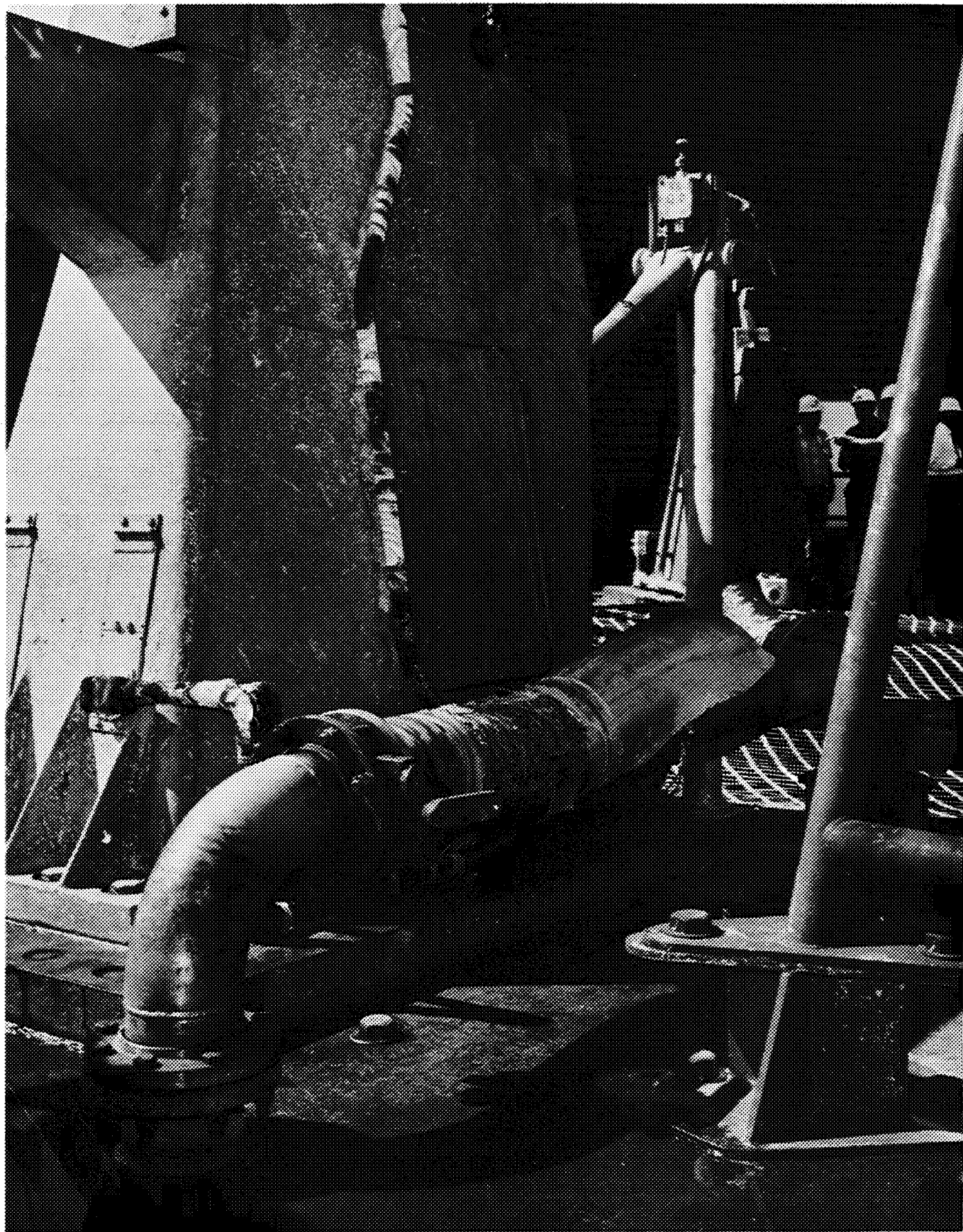


Figure 4. Water Quench Line, at Holddown Arm I.



Figure 5. Fuel Transfer and Water Quench Lines,
between holddown Arms I and I-II.

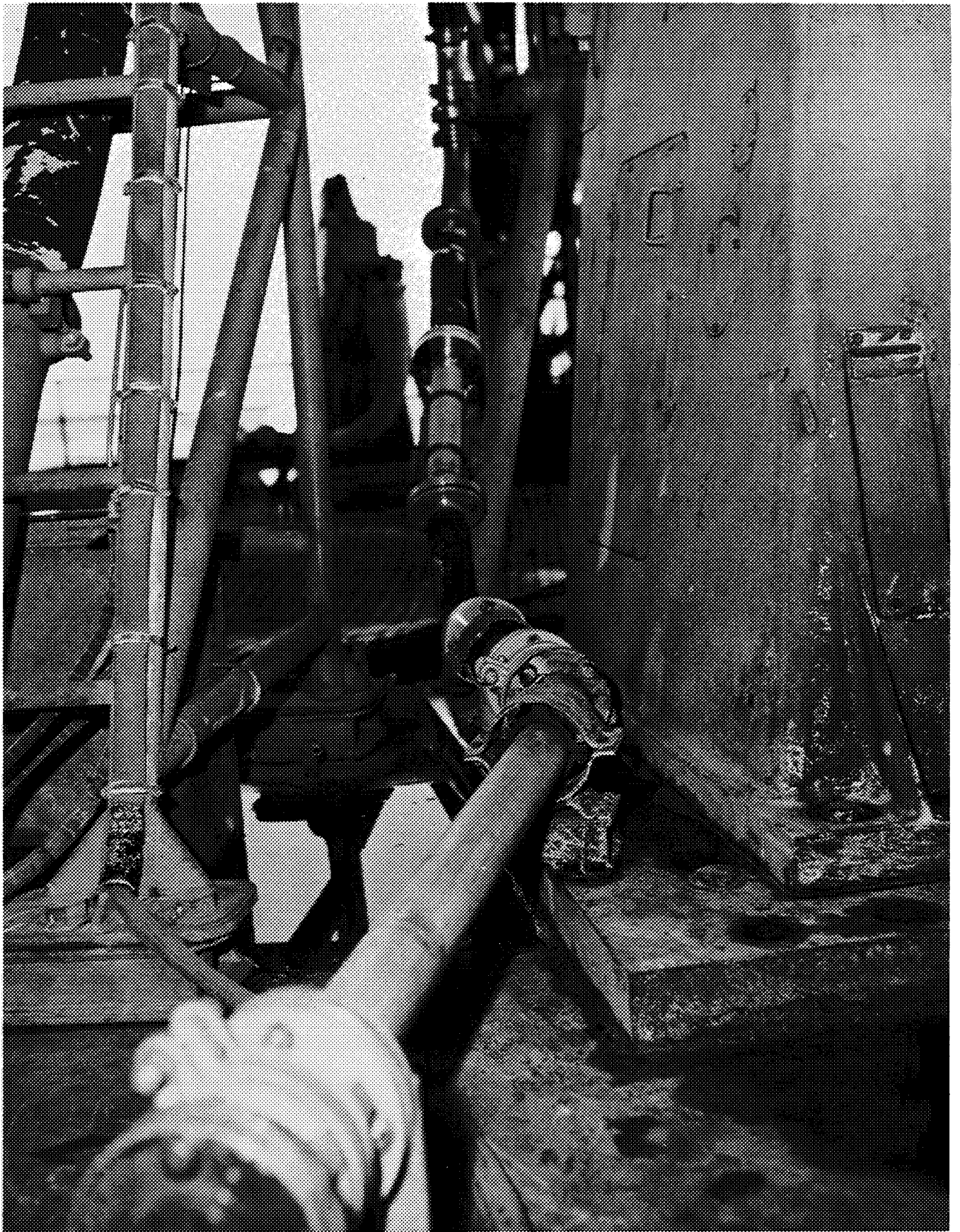


Figure 6. LOX Replenish Line, near Holddown Arm IV.



Figure 7. Short Cable Mast No. 4.

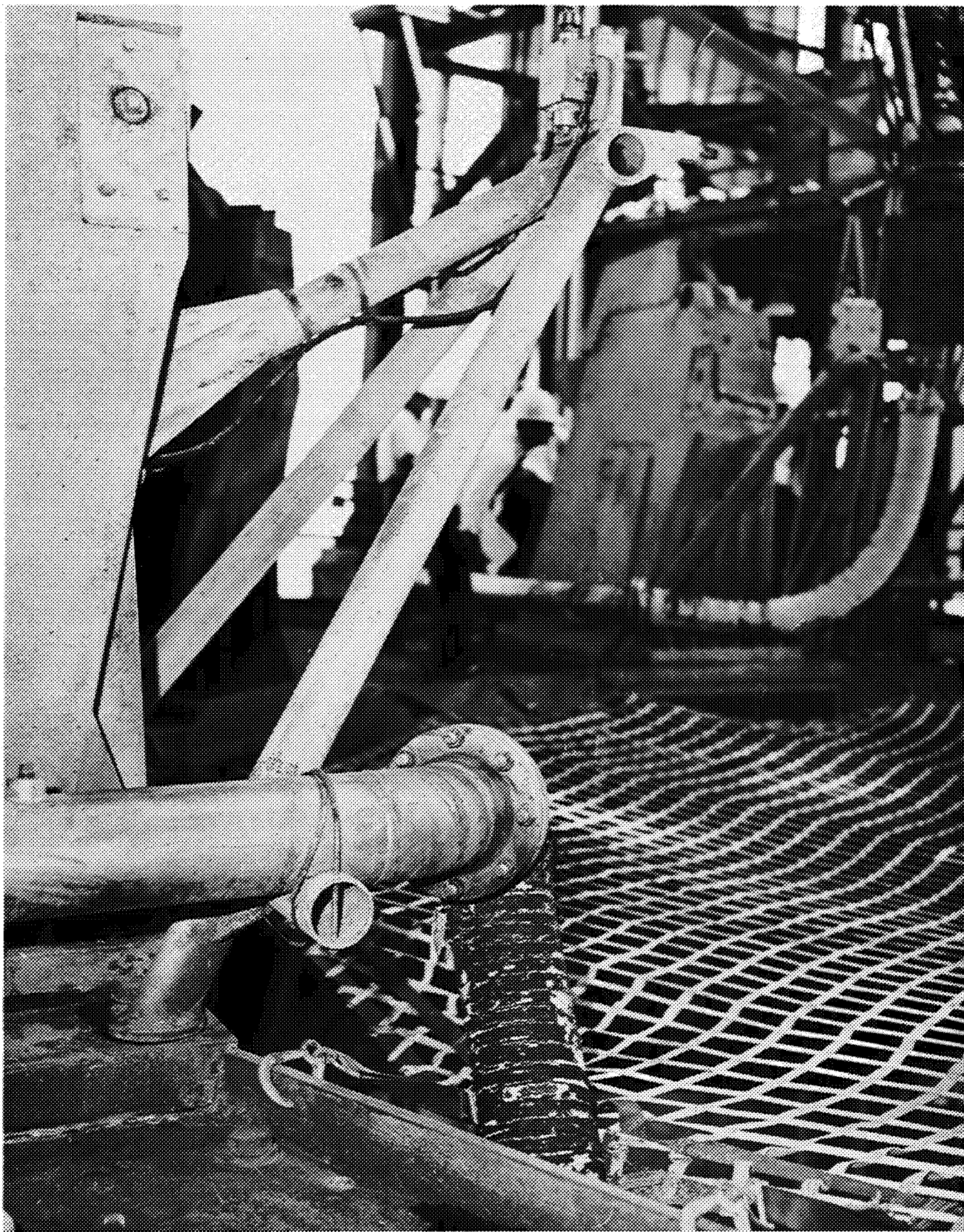


Figure 8. Water Quench Line, at Holddown Arm III.

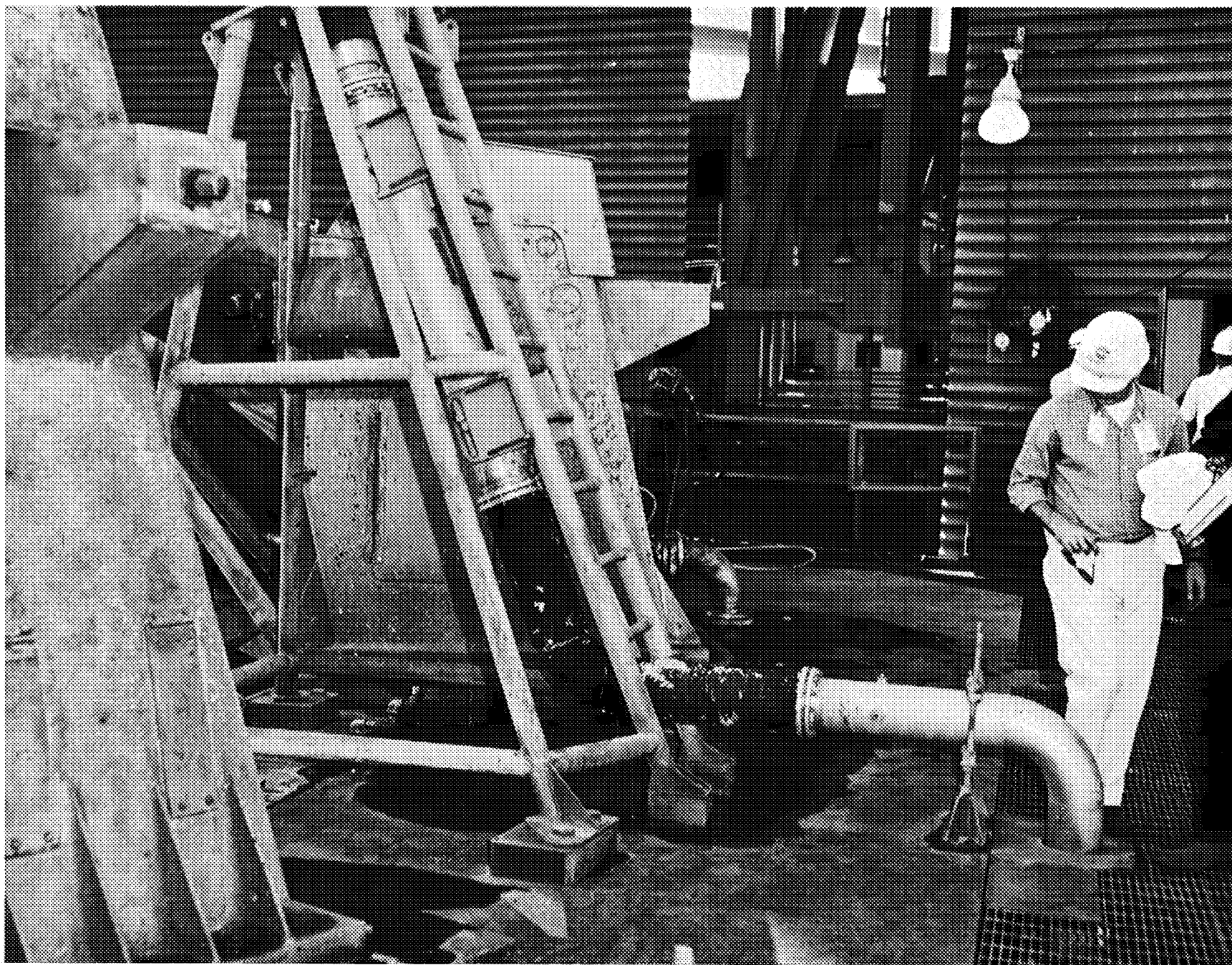


Figure 9. LOX Fill Mast. showing transfer line.



Figure 10. LOX Fill Mast, showing pneumatic lines.

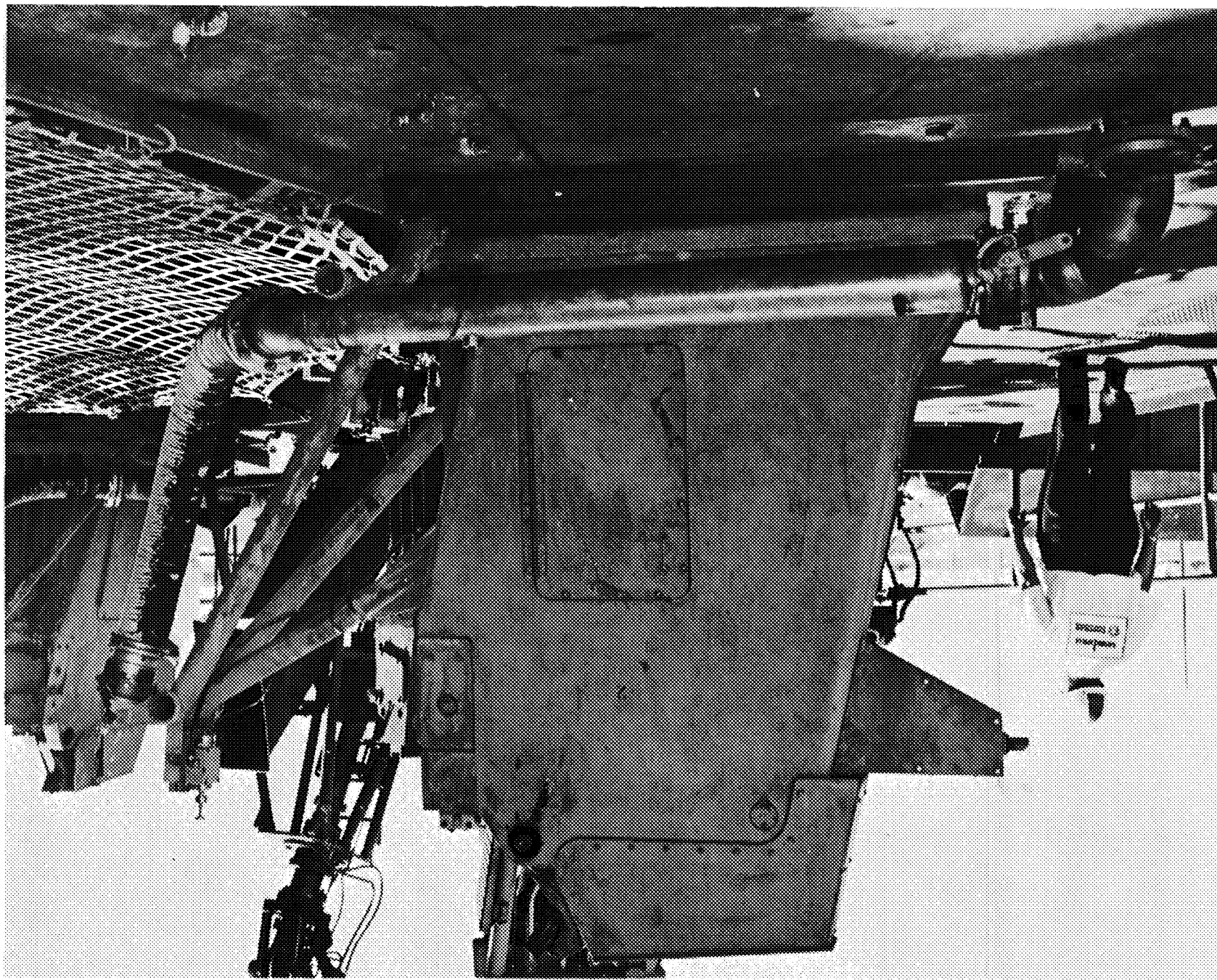


Figure 11. Water Quench Line, at Holddown Arm II.

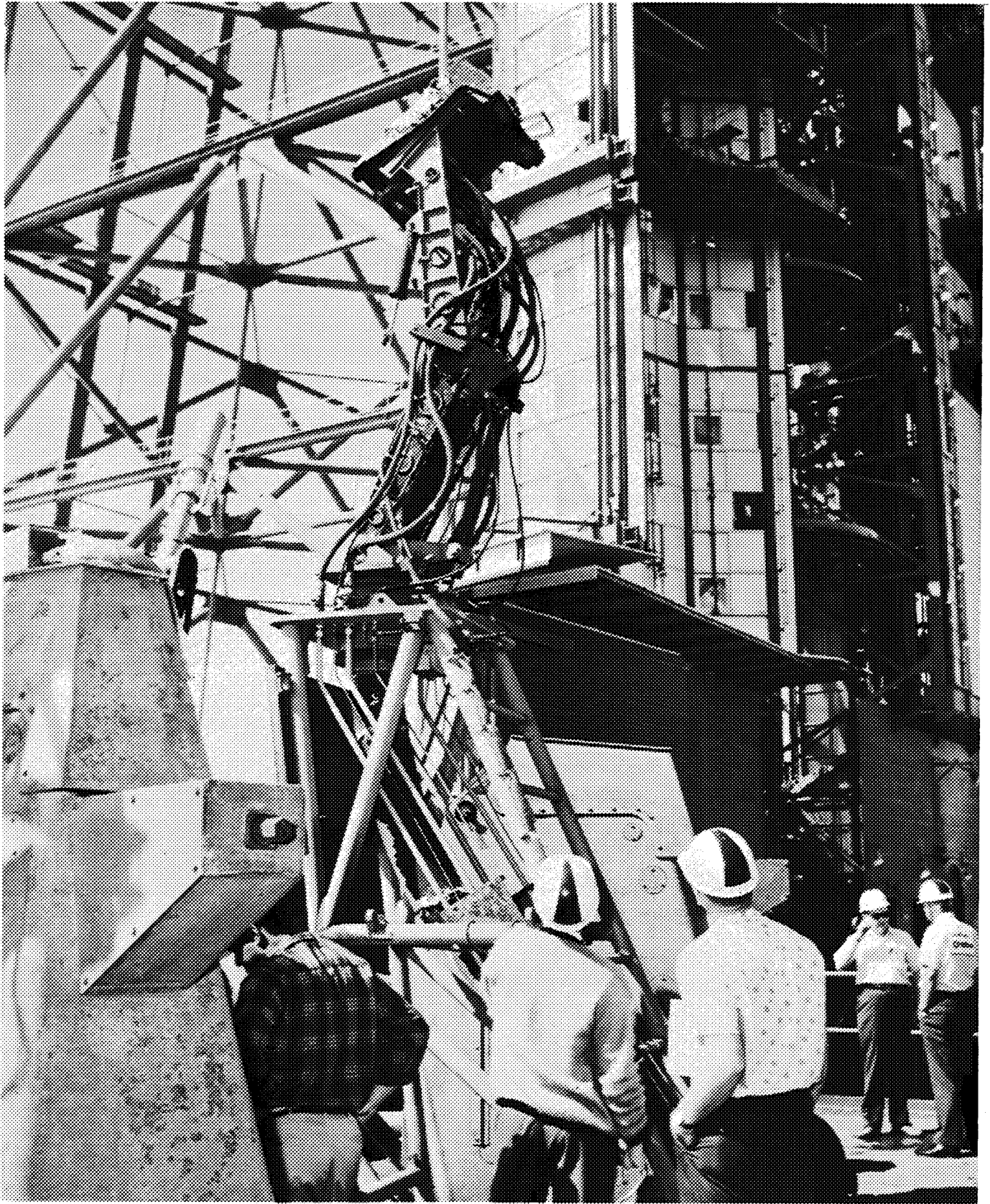


Figure 12. Short Cable Mast No. 2.

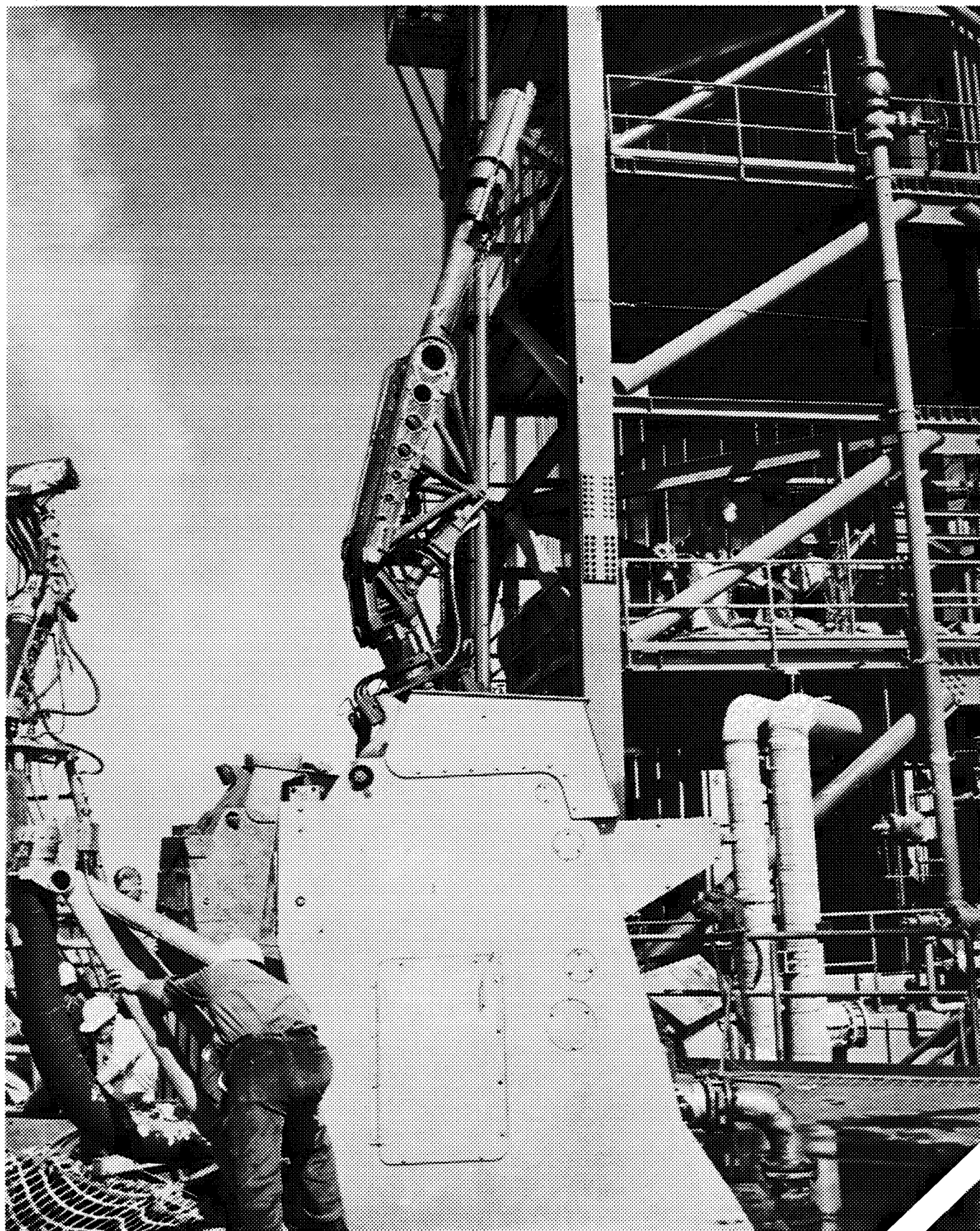


Figure 13. Fuel Fill Mast.

Figure 14. Umbilical Swing Arm No. 1.

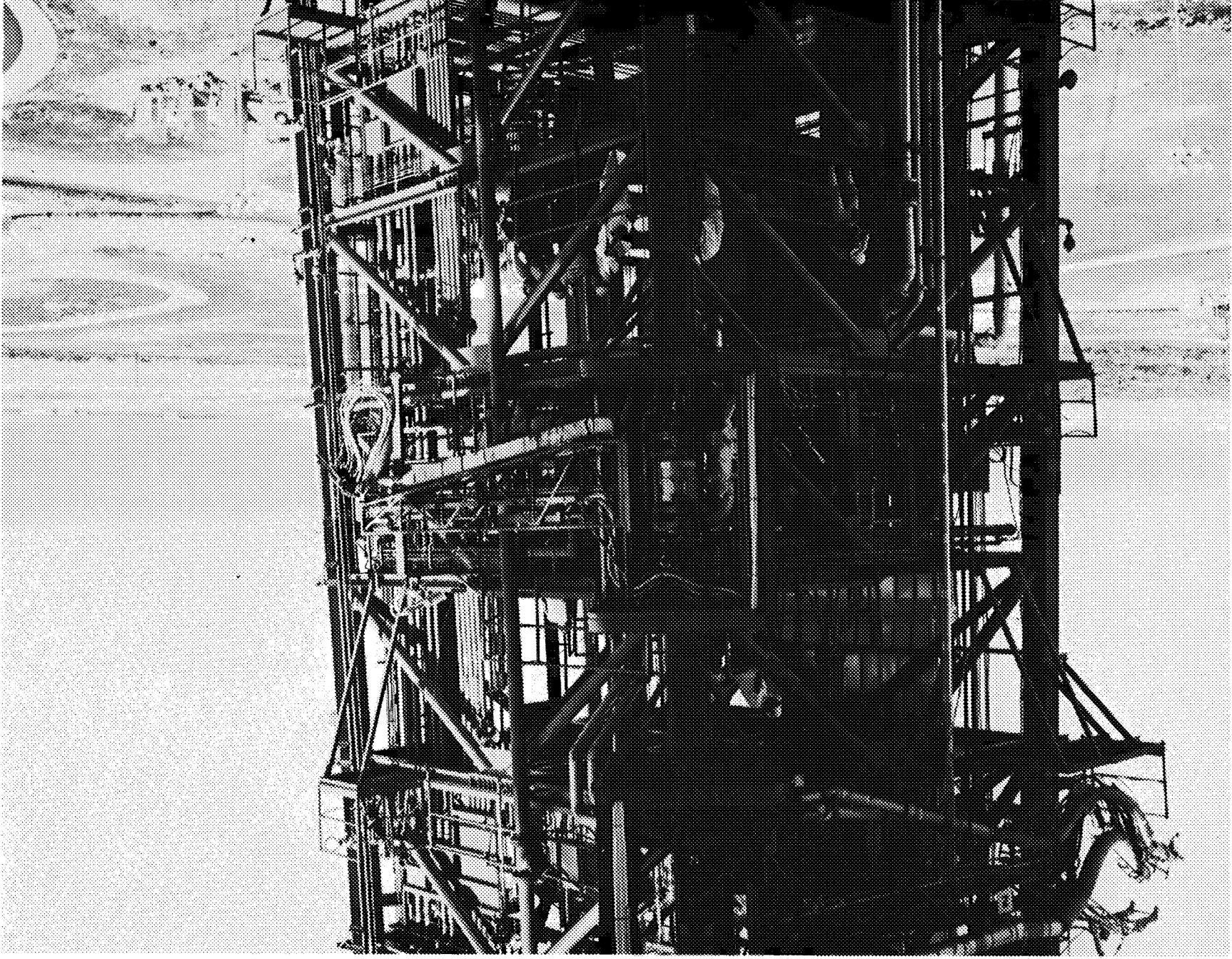
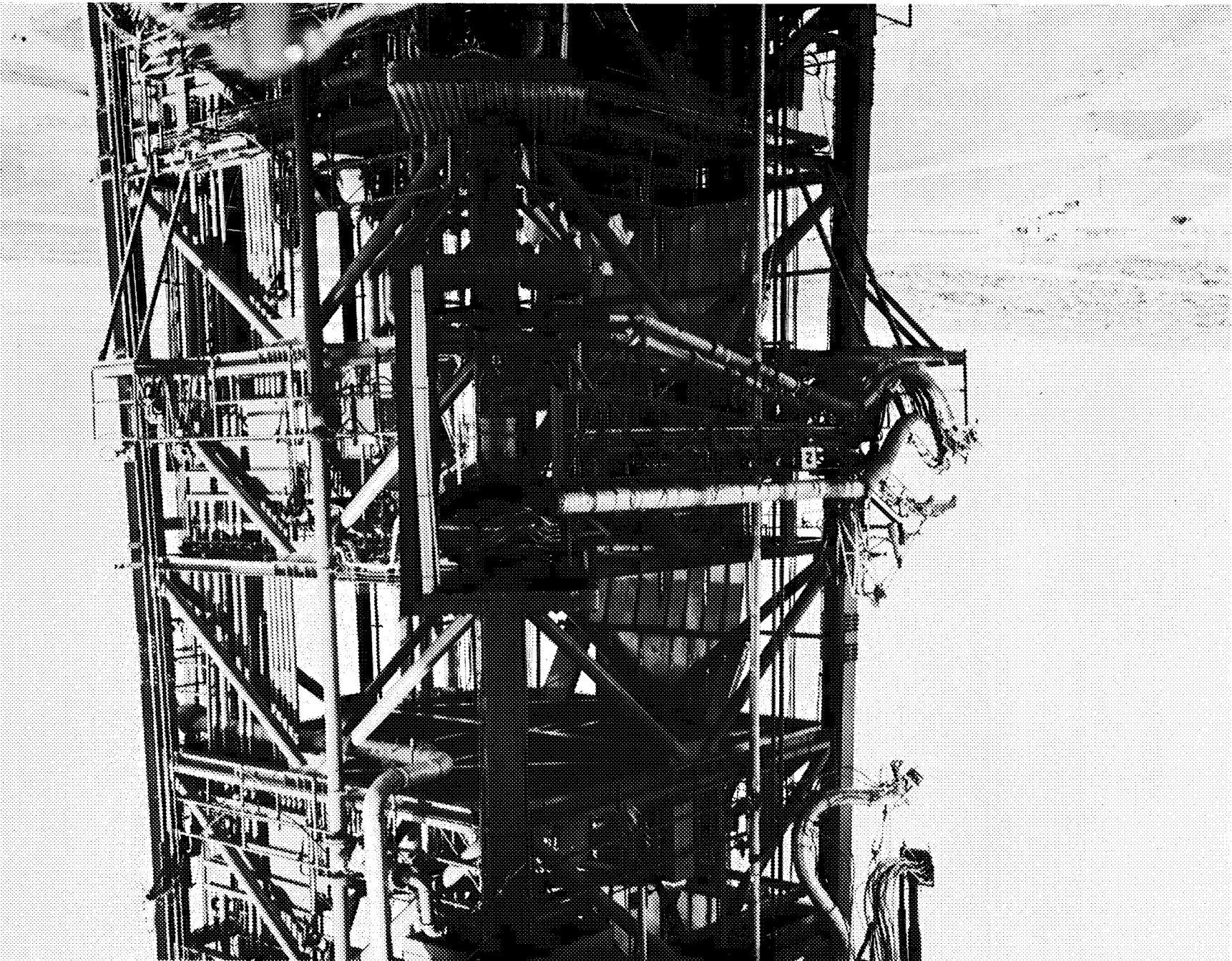


Figure 15. Imbittical Swine Arm No. 2.



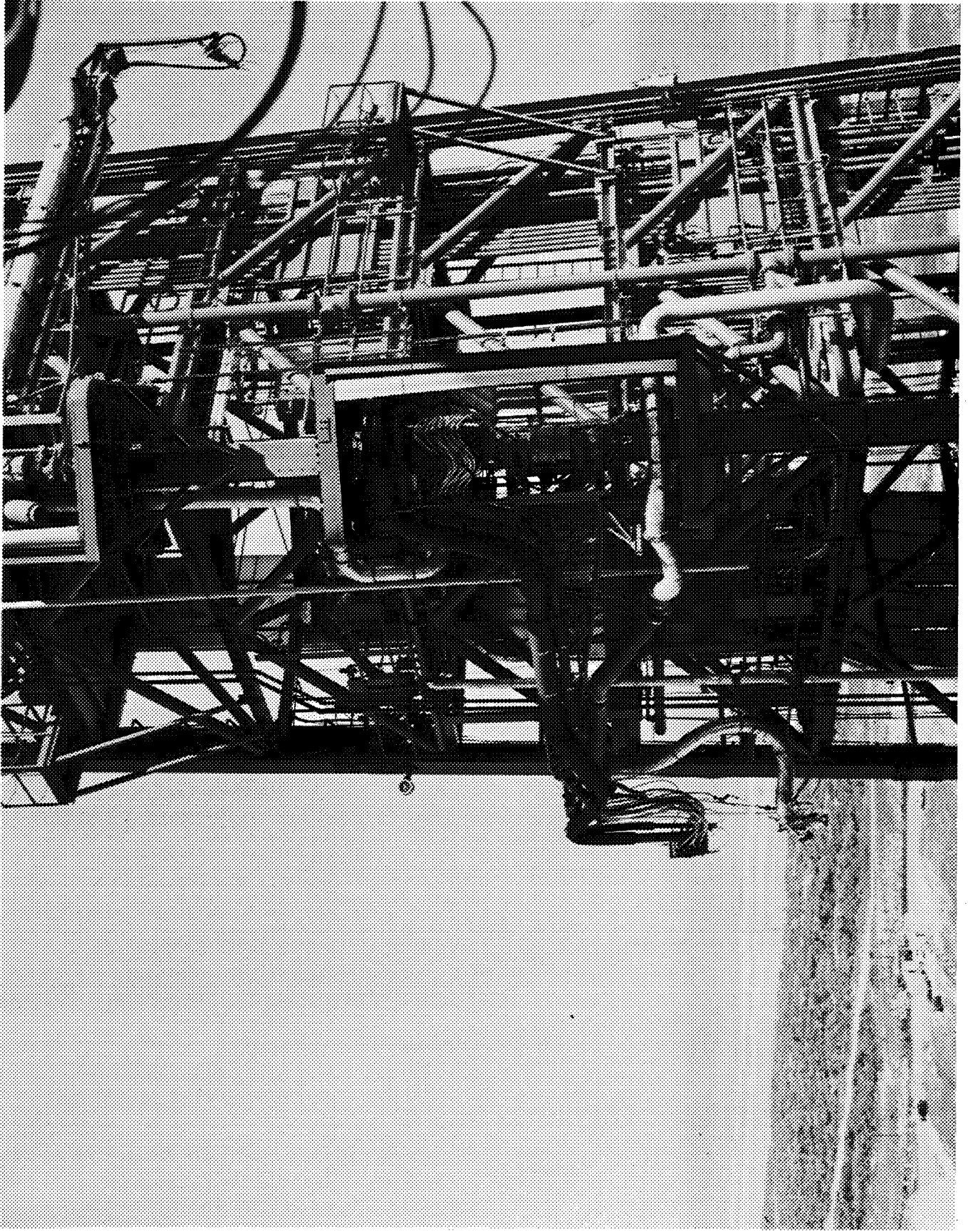


Figure 16. Umbilical Swing Arm No. 3.

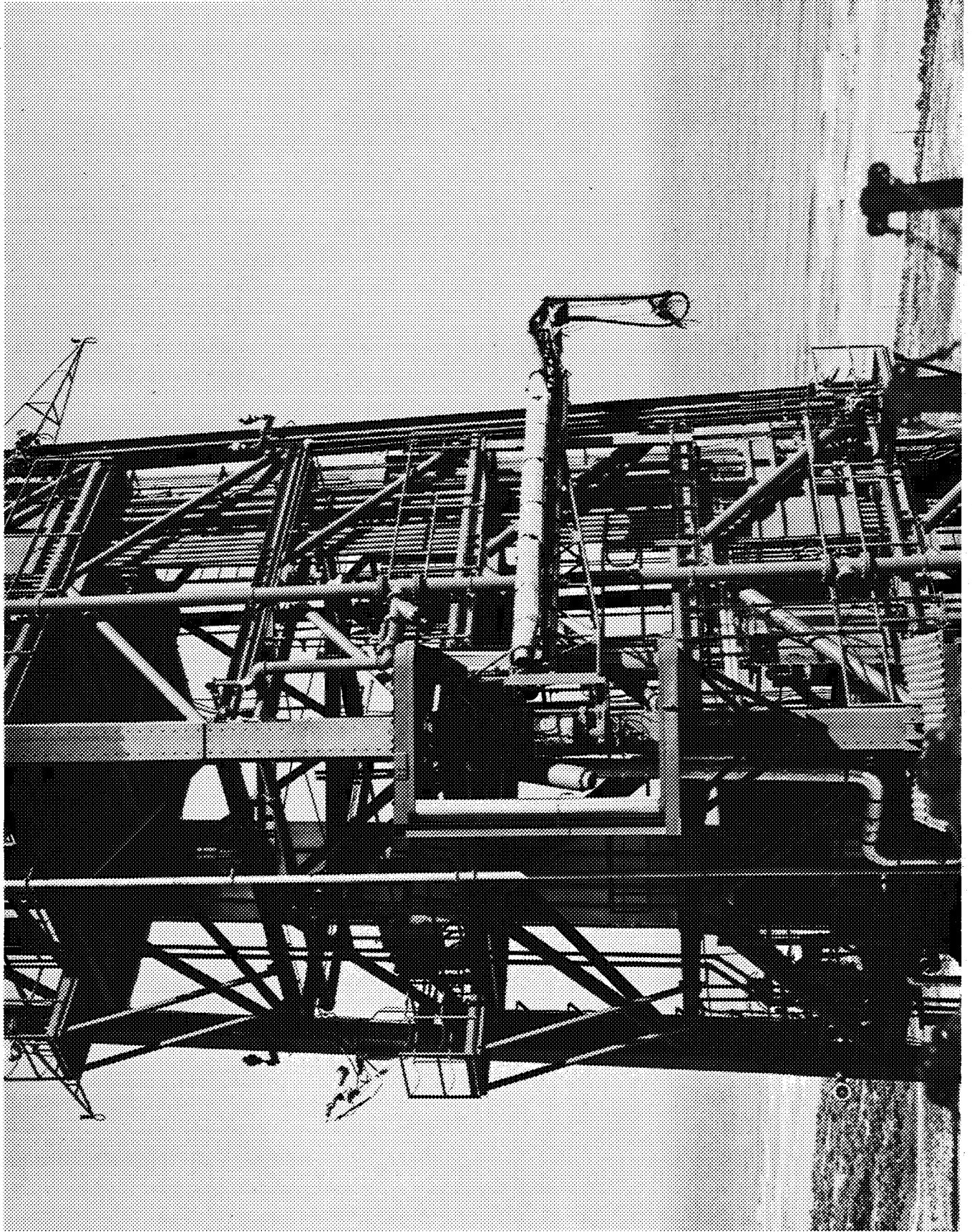


Figure 17. Umbilical Swing Arm No. 4.

ational programs were inserted to support SA-9 launch checkout. Launch occurred at approximately 0937 EST, February 16, 1965, and computer participation was terminated at T+30 seconds. Post-test operations began immediately thereafter and were completed within 2 hours. The computer was energized for a total of approximately 14 hours in support of the launch.

E. FACILITIES AND STRUCTURES

Damage to the flame deflector, figure 18, was greater than that sustained after the previous launch, but not serious enough to require any repair. Some washout of the Fondu-Fyre coating, figure 19, as well as cracks in the vertical plane of the coating occurred. The visible cracks are all very shallow; the integrity of the basic bonding remains good. (After three launch operations the Fondu-Fyre coating and structural integrity of this flame deflector are still in satisfactory condition for future use.)

The floor-leveling selector wheel, figure 20, of the umbilical-tower elevator located on the fourth, or 48-foot, level of the umbilical tower is enclosed in a heavy metal cabinet that was sandbagged to the top. The wheel was skewed so that the majority of the floor level microswitches were either not making contact or had been bent out of alignment. The damage was not as severe as experienced in previous launch operations. The wheel was repaired and the elevator back in operation the next day.

The hydro-pneumatic-system storage tank on the fourth, or 48-foot, level of the umbilical tower sustained damage as shown in figure 21. The oblong object just to the right center of the picture is the GN_2 gas float type regulator. Gas supply pipes to this unit were broken, allowing leakage of water and GN_2 gas pressure as indicated by the glassless-faced gauge to the left. Glass sight gauges just beneath and to the right of the gauge were not damaged. The gauge on the far right was not affected. This is the first launch operation in which this unit has sustained damage.

The third, or 35-foot, level of the umbilical tower on the off side from the launch pedestal sustained only burn damage to Neoprene-coated, minerally insulated cable, figure 22. Damage on this level was normal and will require only cleanup. Cables will not have to be replaced.

As a result of the failure of the torus ring water supply pipe, flooding and damage to the AGCS Building occurred. Figure 23 shows the air-conditioning equipment room on the first floor. Tile and plaster on the ceiling was water soaked from above and fell, as evidenced by the picture. The floor was covered by more than one inch of water. Electronic equipment, being mounted above the highest water level, was not damaged. The networks office area on the second floor of the AGCS Building was deluged by the water. Desks, books, papers and drawings were soaked. Water on this level leaked through the false floor and spread out in the cable routing area under the floor and leaked through to the first floor.

The third floor of the AGCS Building was the first to feel the effects of the flooding. When the torus ring water supply pipe broke (at 175 psi

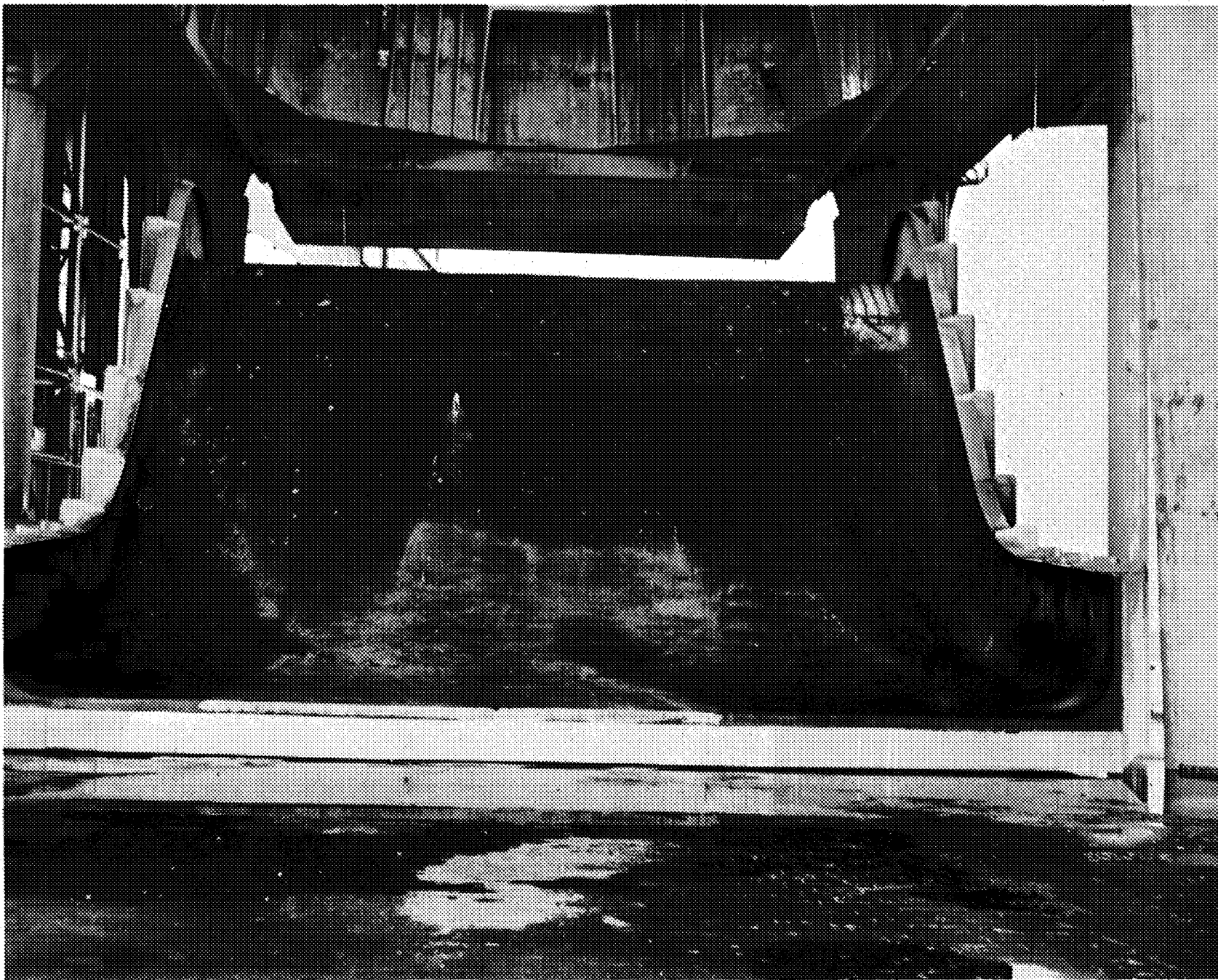


Figure 18. Flame Deflector

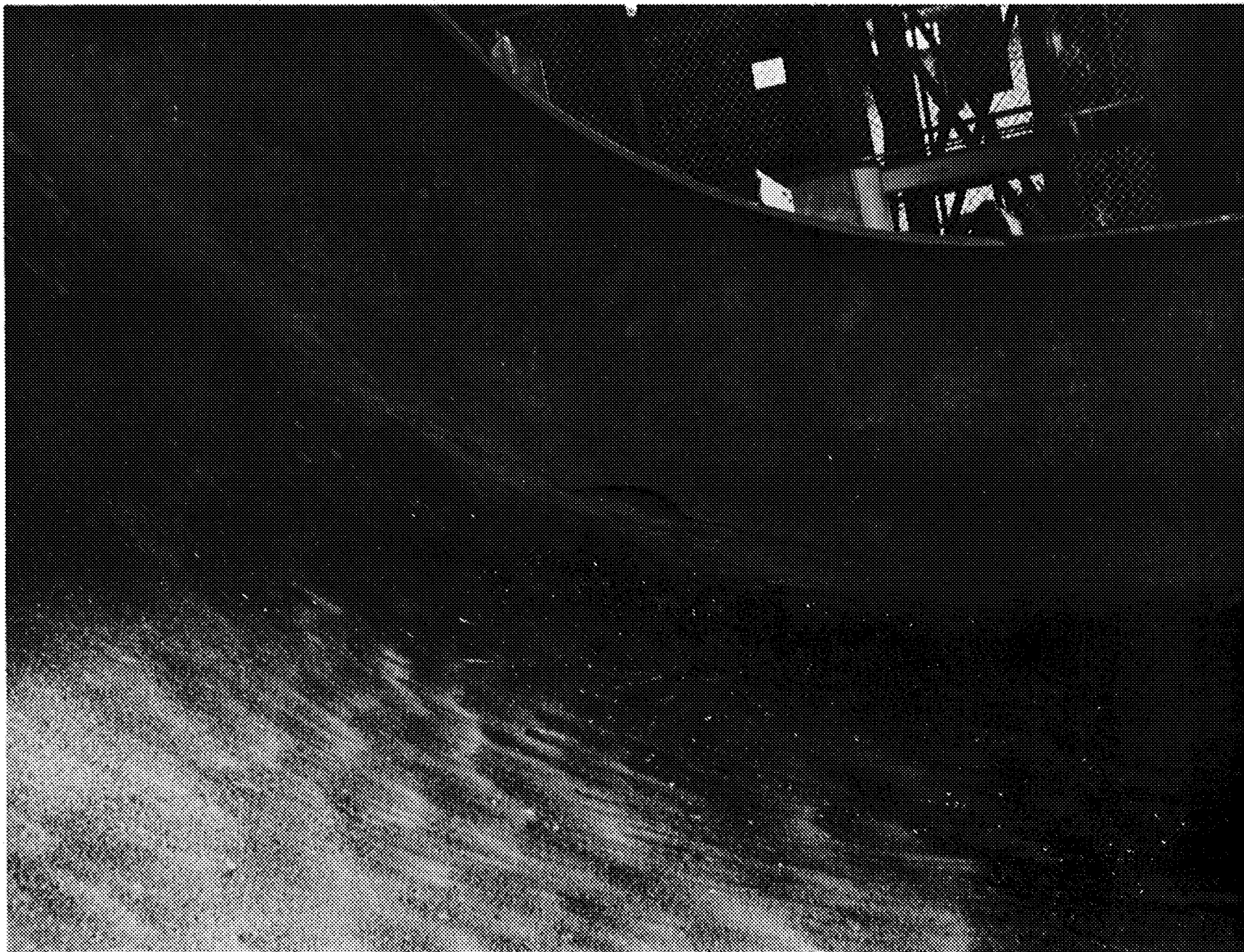


Figure 19. Flame Deflector, showing surface coating.

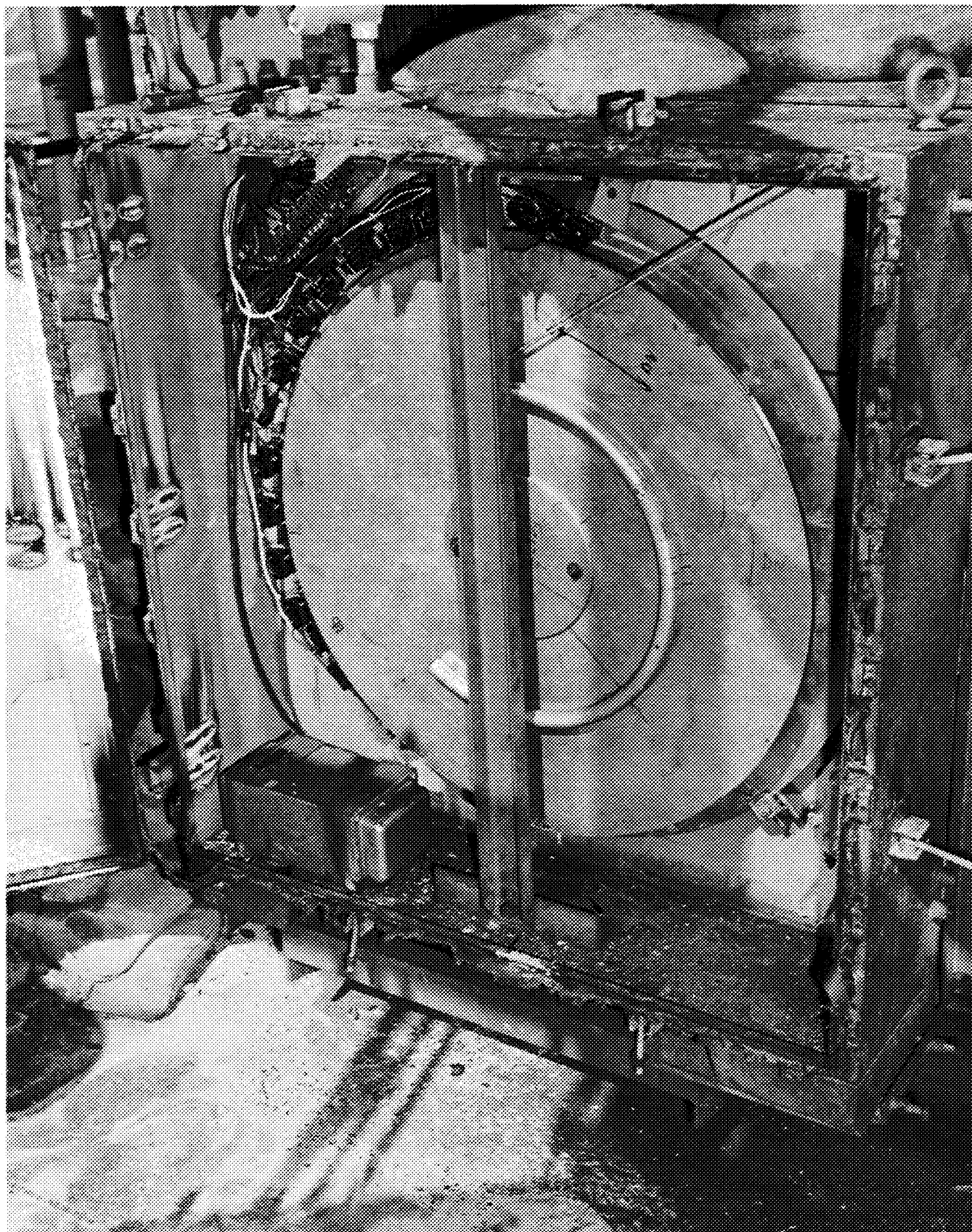


Figure 20. Umbilical Tower Elevator Floor Selector Wheel.

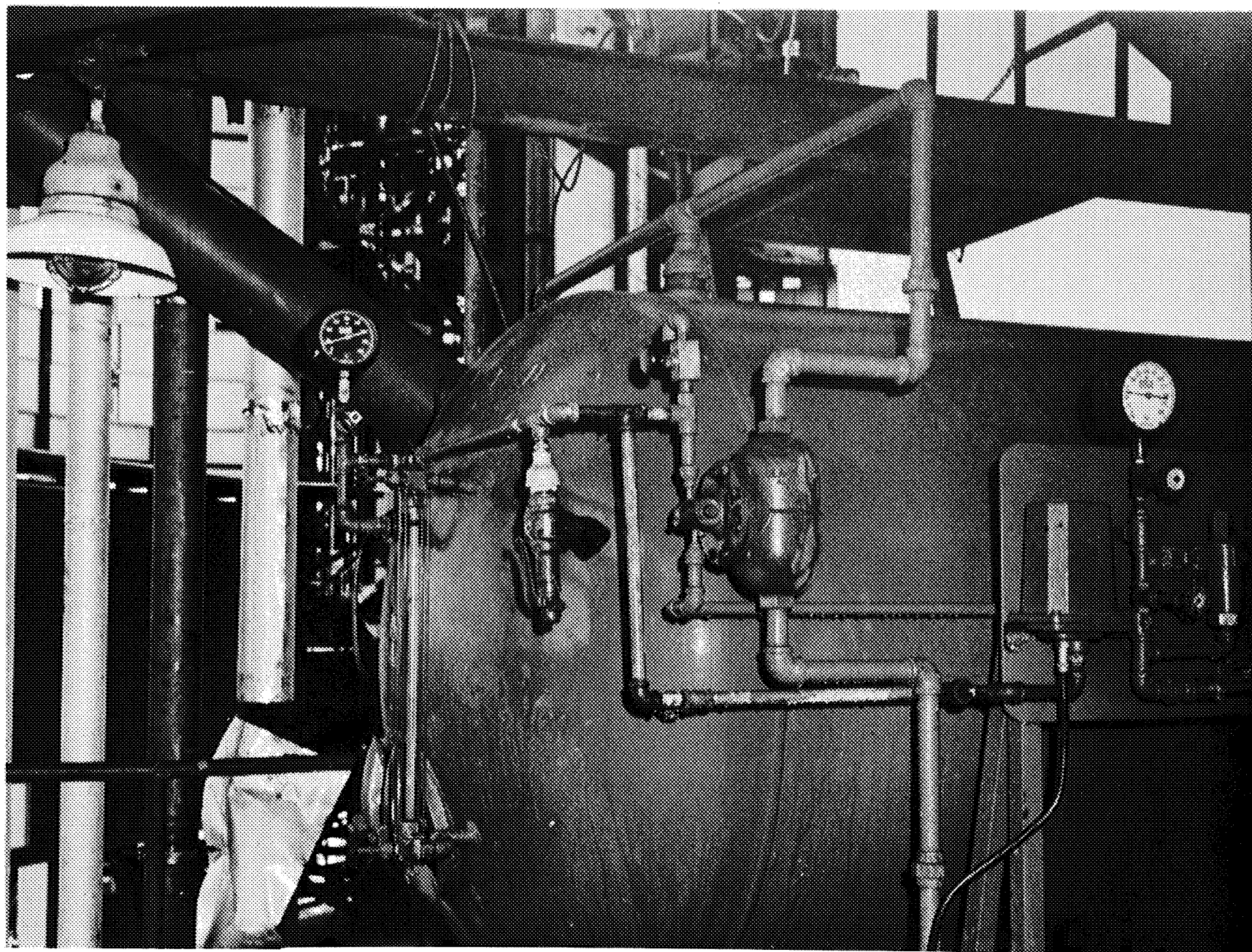


Figure 21. Umbilical Tower Hydro-pneumatic System Storage Tank.

Figure 22 is missing from the original document

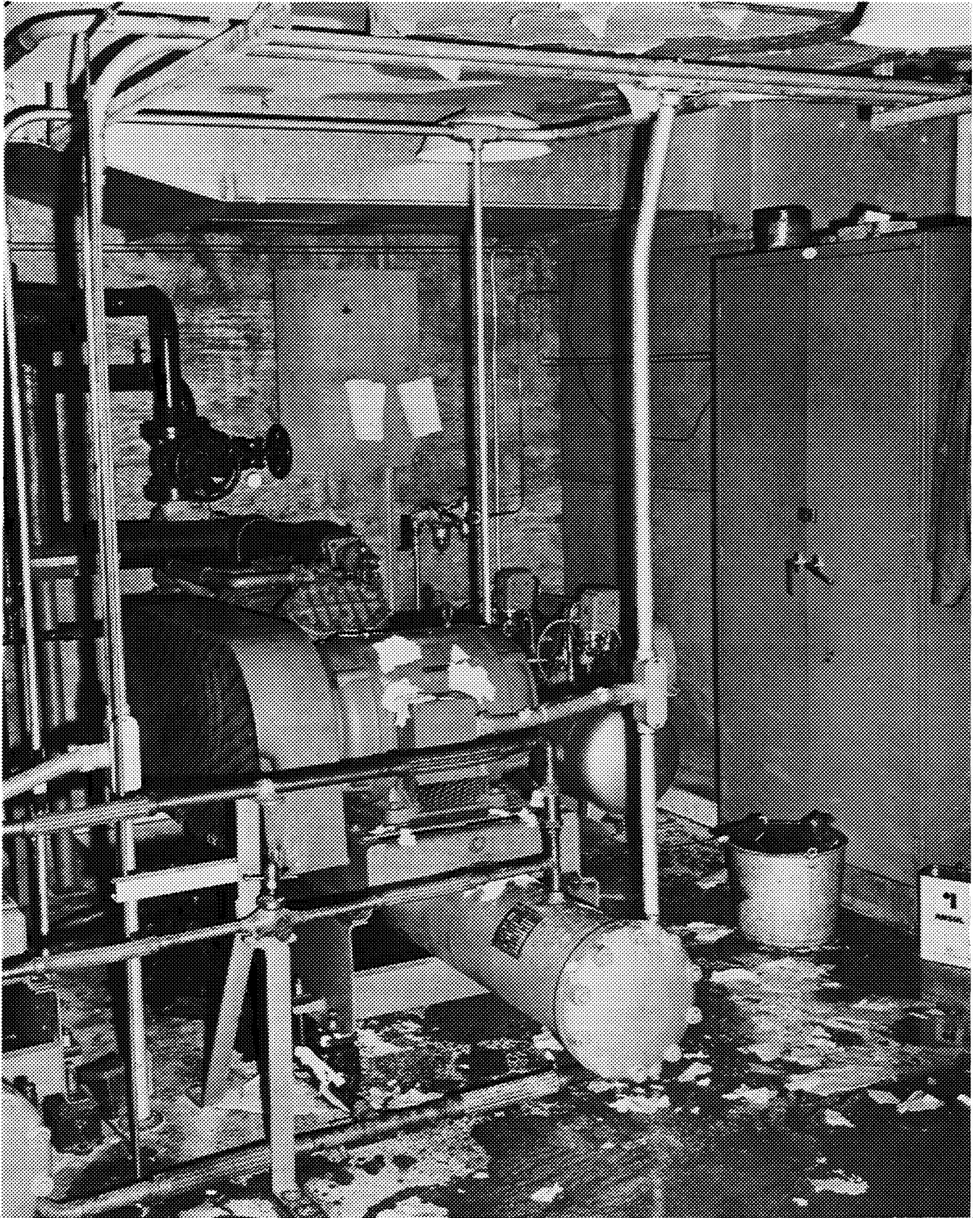


Figure 23. Air-Conditioning Equipment Room in AGCS Building.

pressure) the launcher bridge was flooded and pressurized from the water. This water was forced through conduits extending from the launcher bridge through the AGCS wall to the third floor. Lockers located about 6 feet in front of the conduits broke the full force of the water streams and prevented any serious damage or shorting out of electrical circuits. There was no electrical equipment damaged as far as is known at this time. Power conduit for the holddown-arm cameras and purge lines located on the pedestal were destroyed. These items are considered expendable and are replaced prior to each launch.

Figure 24 shows the covers over the high-pressure gas line expansion pit. The framework was raised (lower center), the access cover holddown bolts were stripped, and the cover was blown away (upper center). This location is roughly 300 feet from the launch pedestal.

In conclusion, the general pad area around the launch pedestal was not as severely burned or damaged as in previous launches. The launch pedestal hydraulic elevator was not damaged and was returned to service within minutes after personnel returned to the pad. Launch damage at LC-37 has always been light and SA-9, except for water damage, was the lightest of any to date.

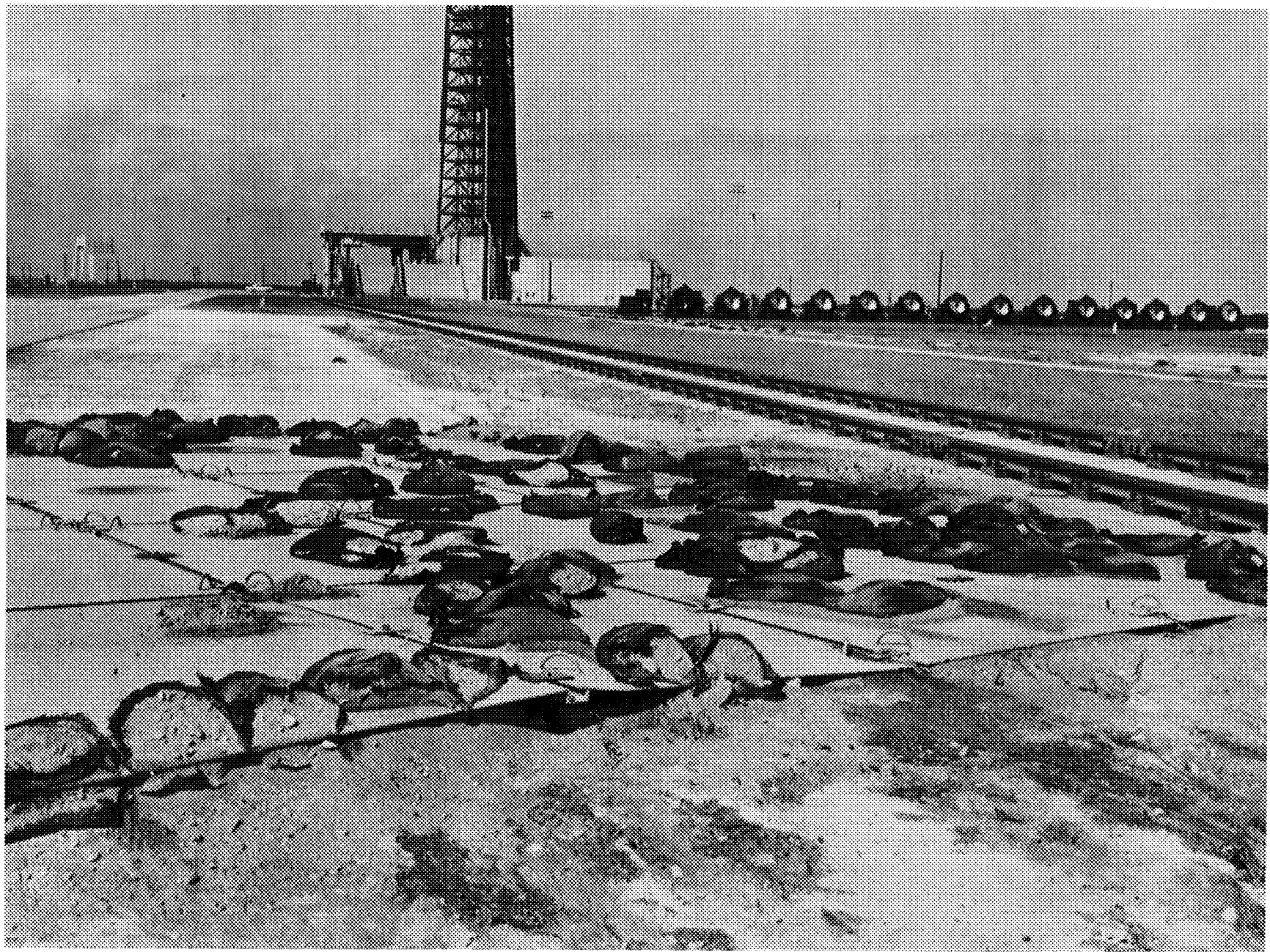


Figure 24. High-Pressure Gas Line Expansion Pit.

SECTION V

MEASUREMENTS AND PHOTOGRAPHY

A. VEHICLE MEASUREMENTS

1. S-I Measuring System

a. During prelaunch checkout activities one measurement (E260-11, "Strain tension tie") was deleted due to a defective gauge. Replacement was not feasible.

b. Evaluation of flight records revealed:

(1) Three measurements (C4-3, C6-2, and D1-3) were lost prior to liftoff.

(2) Five measurements (C2-06, C63-1, C215-10, C291-3, D-116-9); had questionable data; i.e., excessive noise, dropouts, etc.

2. S-IV Measuring System

a. During prelaunch checkout activities, seven measurements were deleted due to defects. Replacement was not feasible.

b. Evaluation of flight records revealed:

Seven measurements (D651-407, D652-407, D604-401, D604-402, D604-404, D604-406, D609-404) had questionable data; i.e., excessive noise, dropouts, etc.

3. IU Measuring System

a. Prelaunch checkout activities were highly satisfactory with no deletion of measurements.

b. Evaluation of flight records revealed that there were no measurement failures.

B. GROUND MEASUREMENTS

1. LCC Recorder System. LCC Recording System operated satisfactorily with no discrepancies or failures.

2. Fire Detection System. Fire Detection System operated satisfactorily with no temperature rise indicated.

3. Combustion Stability Monitor System. Combustion Stability Monitor System operated satisfactorily. However, the validity of a portion of the data recorded for XE-57-3, Combustion Stability Monitor Longitudinal engine position 3, is under investigation.

4. In-Flight Fire Detection System (Passenger). The in-flight fire detection system operated satisfactorily with no indication of excessive temperatures.

C. PHOTOGRAPHY

1. Complex 37 Cameras.

a. All Documentary and Engineering sequential cameras were installed

checked, and green-lined by 1845 EST on L-1 day.

b. All cameras functioned properly; however, some loss of data occurred due to a timing malfunction. Extent of data loss is not known at this time.

2. Film Deliveries.

a. Quick look items were received within 24 hours after launch as specified.

b. Normal film deliveries were received well within specified times.

SECTION VI

RELIABILITY AND QUALITY ASSURANCE

Figure 25 presents a comparison between SA-9 and SA-7 regarding the number of failures reported for propulsion stages, the instrument unit, payload (Pegasus) and various operational ground support equipment. Failure reports on spares, ground instrumentation sites, or those prepared by Launch Support Operations Division are not shown. Further, only the reports processed through February 13, 1965, are included in the chart. Updated information will be contained in the SA-9 Failure Summary Report.

S-I Stage failures show a decrease of 17.3% between SA-7 and SA-9, while S-IV Stage failures dropped 37.2%. Failure reports for the IU decreased by 25.8%.

MSFC ground support equipment failure reports decreased 16.4% from SA-7 to SA-9, and KSC-D ground support equipment failure reports decreased 7.7%. Douglas Aircraft Corporation GSE failure reports decreased by 71%.

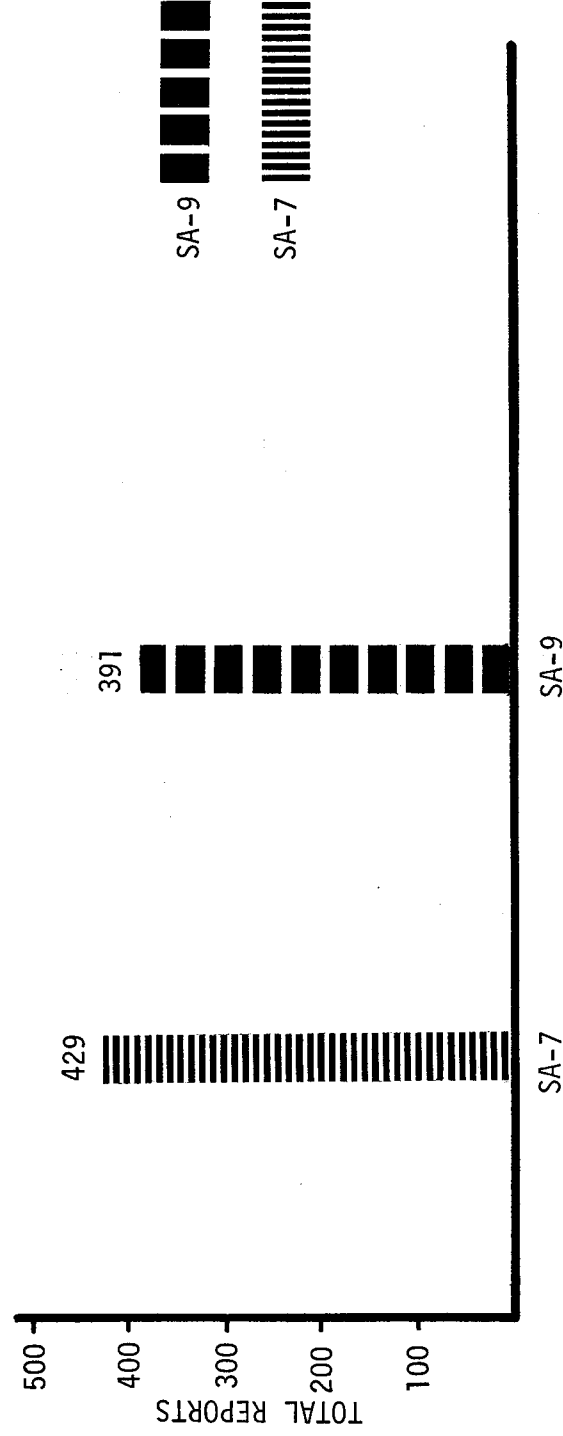
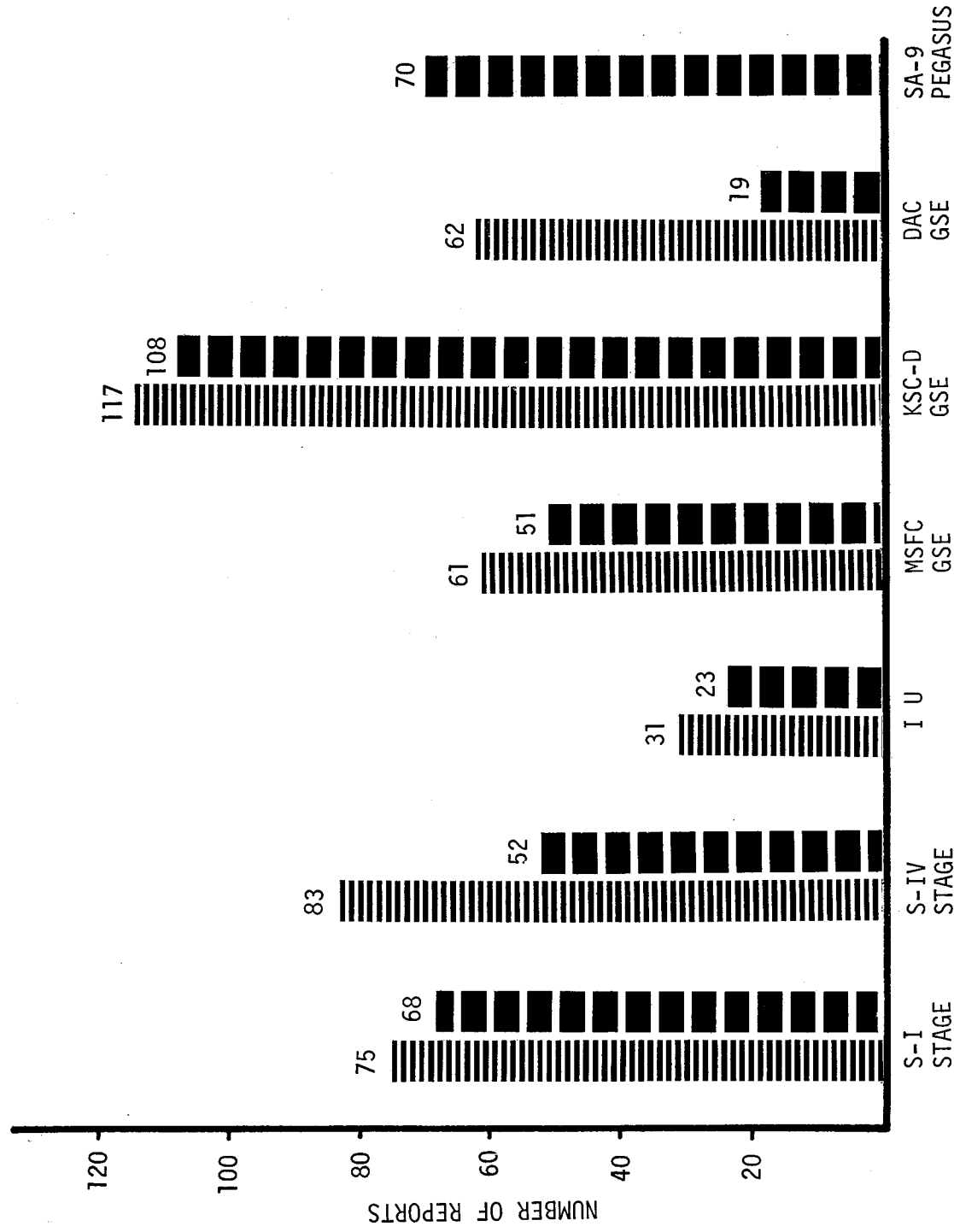


Figure 25. SA-9 Unsatisfactory Condition Reports.

SECTION VII

ATMOSPHERIC CONDITIONS

A. SUMMARY

A high-pressure center in North Carolina resulted in an easterly flow over Florida. The trajectory of the low level winds produced by this high was over water. When combined with subsidence from above the effect was sufficient to modify a shallow dome of cool air and give central Florida a low scattered layer of clouds at launch time.

B. TABULATED WEATHER DATA (16 February 1965)

CAPE KENNEDY												
TIME (EST)	CLOUDS			Base (ft)	Quad Cover	Visibi- lity (mi)	Pressure MSL in MRS	Dry Bulb (B)	Dew Pt. (F)	R.H. (%)	WIND	
	Amt	Type	Dir. Deg. Az.								Velo- city (Kts)	
0900	5	Sc	24	8118	10	1024.4	72	66	80	080	07	
	1	Ci	UNK	0110								
0915	3	Sc	24	4114	10	1024.4	72	65	78	090	09	
	1	Ci	UNK	1120								
0930	2	Sc	26	3111	10	1024.4	72	65	78	110	08	
	2	Ci	UNK	1222								
0940	1	Sc	26	2111	10	1024.4	74	65	74	110	10	
0955	2	Sc	26	2112	10	1024.4	73	65	75	120	10	
	2	Ci	UNK	1122								
GRAND BAHAMA ISLANDS												
0900	6	Cu	E12	6666	10							
	3	Sc	45	4432								
	2	Ac	90	2222								
0937	8	Sc	E40	8887	10RW-	1024.4	73	68	87	070	10	
	3	Ac	90	3333								
	4	Cu	12	4444								
0952	4	Cu	12	4444	10RW-	1024.4	71	69	95	070	08	
	8	Sc	E40	8887								
	3	Ac	90	3333								

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